

California's High-Tech Industries and Information Technology Occupations

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**Labor Market Information Division
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**The views expressed are those of the authors and do not reflect the policies of
the Employment Development Department or the State of California**

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Highlights

We have once again reviewed our labor market information about California's high technology industries and information technology occupations. This paper helps to document the high-tech boom and beginning of the employment decline in 2001 and 2002.

High Technology Industries

- From 1990 to 2001, annual average employment in the high-tech industries increased by 38.9 percent compared to overall industry growth of 16.8 percent.
- From 2001 to 2002, annual average employment in the high-tech industries declined by 55,900 or 44.5 percent of the overall industry decline of 125,500 jobs.
- While high-tech manufacturing employment trended down and fluctuated around 400,000 jobs throughout the 1990s, high-tech services industries employment doubled, from 300,000 to 600,000 jobs.
- The most dynamic industry of the high technology boom was computer programming and related services – its high point was the fourth quarter of 2000 with 400,000 workers and a payroll of \$10.8 billion.
- Information about new hires, job gains and job losses helps to describe the dynamic changes in the high-tech industries in the period 1998-2001.
- Despite the current downturn, high-tech services industry employment growth is expected to be three times that of all growth through 2010.

Information Technology Occupations

- IT professionals comprise about five percent of the Nation's workers, eight percent of California workers, and 28 percent of Santa Clara County's workers.
- Nearly two-thirds of California's information technology (IT) professionals work in the high technology industries, while less than 50 percent of these professionals work in high-tech in the United States.
- Employment of software engineers grew from 80,000 to 120,000 in the year from 1999 to 2000.
- Nearly three-quarters of the State's software engineers work in the computer programming and related services industry.
- As found in earlier reports, and continuing up to the year 2000, about two-thirds of employers reported significant difficulty in recruiting qualified IT professionals throughout the State. This changed in 2001 and 2002--only about half still reported some difficulty.
- Through the end of the decade, California is projected to need more than 40,000 IT professionals annually to fill anticipated job openings.

Introduction

This is the third Employment Development Department (EDD) study of California's high-tech industries and information technology (IT) workers. The focus is on information technology; it does not include the many manufacturing or services industries that use technology, such as biotechnology, aerospace manufacturing, finance or medical technology.

Circumstances in the high-tech economy have changed since the earlier studies were completed. The March 1998 report concluded that the labor market for IT professionals was tight and was expected to tighten further. The evidence included:

- Projected high demand for IT professionals
- Higher than average wages paid in the high-tech industries
- An increasing level of recruitment of foreign workers, and
- Survey results that employers were having difficulty finding qualified IT professionals

The January 2000 report confirmed these conclusions. A much larger sample of employers over a three-year period again reported difficulty hiring qualified workers. "Shortages of IT workers" was a newsworthy issue, and the high-tech industries successfully lobbied for a federal law that increased the allowable number of labor certifications for temporary H-1B foreign workers, most of whom were computer professionals in California.

This paper again examines the workforce characteristics and trends in California's high-tech industries, and describes the employment experience and projected demand for IT professionals.

Our analysis is based on data collected by the U.S. Bureau of Labor Statistics, EDD's Labor Market Information Division, and EDD's partners in 38 local areas covering all of California. This paper generally describes the period through 2001, the last year in which Standard Industrial Classification coded industries were consistently matched with Standard Occupational Classification coding. Subsequent papers will report industries using the North American Industry Classification System.

High Technology Industries

Definition

There are nine industries that we have defined as “high-tech” industries for this paper. These industries were defined using the Standard Industrial Classification (SIC) coding system rather than the recently published North American Industry Classification System (NAICS). The SIC system was used because much of the data we have available on occupations associated with industries is based on the SIC. In future papers, the NAICS scheme will be employed.

The nine SIC coded industries employed more than half the information technology (IT) professionals in California, as defined in the occupational employment section. We categorized the nine industries in the following groups:

High-tech manufacturing industries:

- Computer and Office Equipment (SIC 357)
- Communications Equipment (SIC 366)
- Electronic Components and Accessories (SIC 367)
- Search and Navigation Equipment (SIC 381)
- Measuring and Controlling Devices (SIC 382)

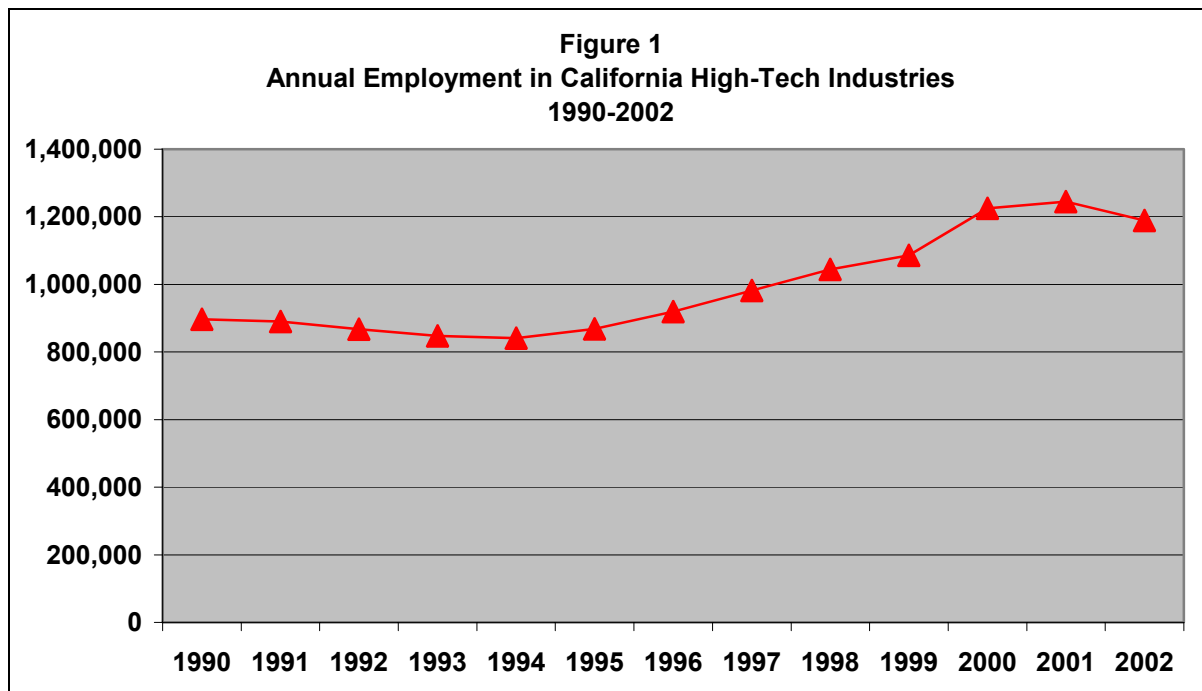
Communications industries (SIC 48)

High-tech services industries:

- Computer Programming and Related Services (SIC 737)
- Engineering and Architectural Services (SIC 871)
- Research and Testing Services (SIC 873)

Industry Employment Trends

From 1990 to 2001, California’s employment in these high-tech industries grew from 896,500 to 1,245,000, an addition of 348,500 jobs, or 38.9 percent. Figure 1 portrays this rapid growth to 2001, but also shows a decline of 55,900 high-tech jobs in the following year.

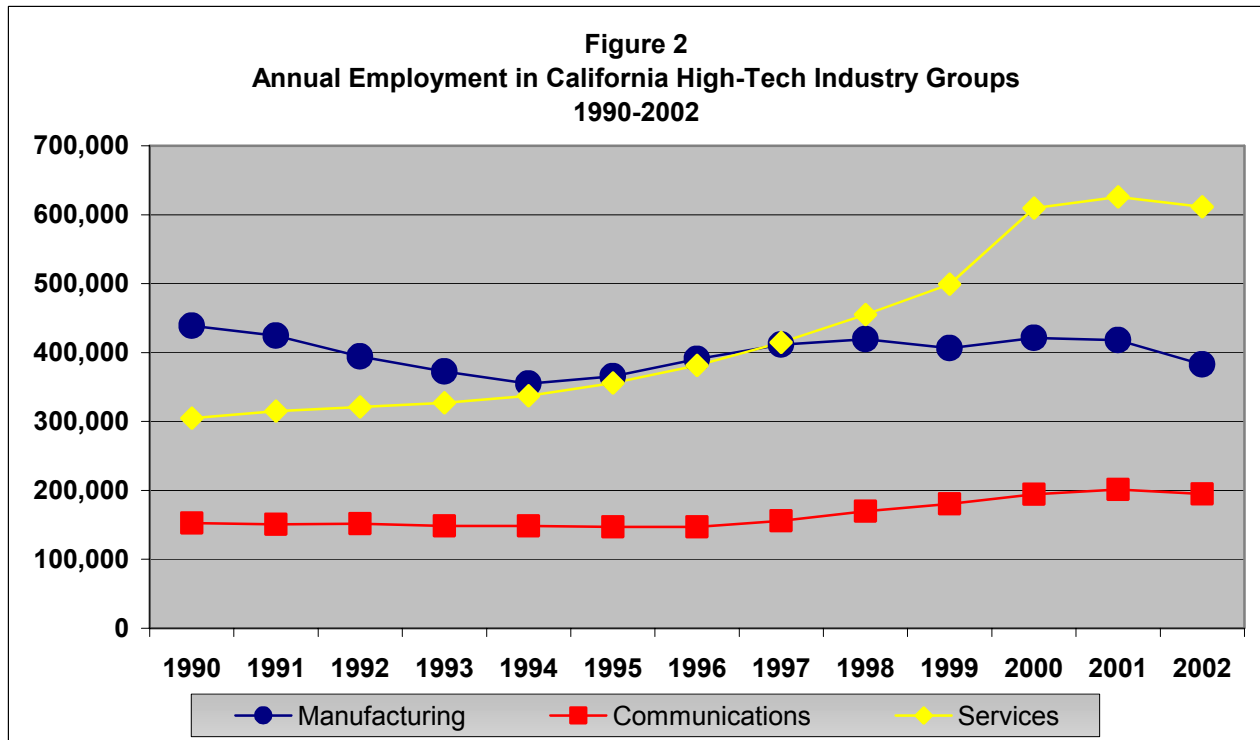


By comparison, California employment in all industries increased by 2.1 million new jobs, or a 16.8 percent growth rate from 1990 to 2001; there was a decline of 125,000 jobs in 2002. When comparing the high-tech proportion of the State's overall employment growth and decline, the high-tech growth represented 16.6 percent, and the decline represented 44.5 percent. This job growth had a significant effect on California's economic boom of the late 1990's, but equally potent has been the concentrated employment decline in the high-tech labor market, and its effect on the economy.

The High-Tech Industry Groups

Figure 2 shows 1990-2002 employment estimates for the nine high-tech industries. The five manufacturing industries experienced declining employment in the early 1990s and some recovery through the second half of the decade. Decline resumed with the new millennium. There was a loss of 38,800 jobs in these manufacturing industries from 2000 through 2002.

While employment in the communications equipment and electronics components manufacturing industries actually increased over the period, jobs in the search and navigation equipment manufacturing industries declined by more than 50 percent.



Communications industry group employment grew by more than 25 percent in the 13-year period. Nearly all of the growth occurred in the late 1990s. From a high point in 2001 of 201,300, the number of jobs dropped to 195,000 in 2002, nearly back to the 2000 level.

In comparison, employment in the three high-tech services industries increased significantly. Since 1990, California has added more than 300,000 jobs in those firms that provide computer, engineering, scientific, research and other information-related services. As in the communications industries, these high-tech services industries reached their highest employment in 2001, 625,600, and then declined by about 14,100 jobs, not quite back to their 2000 employment level. Appendix Table A shows the detailed industry data.

The most dramatic increase was the 250 percent employment growth in the high-tech services industry group called Computer Programming, Data Processing, and Other Computer Related Services (SIC 737). The number of jobs increased from 100,700 in 1990 to 355,200 in 2002. This group of industries includes computer programming services, prepackaged software, and systems design. This industry alone accounted for more than 80 percent of the increase in high-tech services industries growth over the period, 19 percent of the employment growth in all services, and nearly 12 percent of total nonfarm employment growth in the state from 1990 to 2002. The growth and dynamics in this industry are described below.

Growth and Decline in Computer Programming Employment

Analysis of the quarterly employment growth and payroll in this industry group supplements the annual trends data. Table 1 shows quarterly employment for the period 1998 through 2001. The high point in this period was the fourth quarter of 2000. There were more than 400,000 workers with a payroll of \$10.8 billion. This is an employment increase of 70.7 percent over the 234,500 workers in the first quarter of 1998, and a payroll increase of 161 percent over the \$4.1 billion in the same period. Because bonuses and other end-of-year payments inflate fourth

Table 1
Computer Programming and Related Services (SIC 737)
California

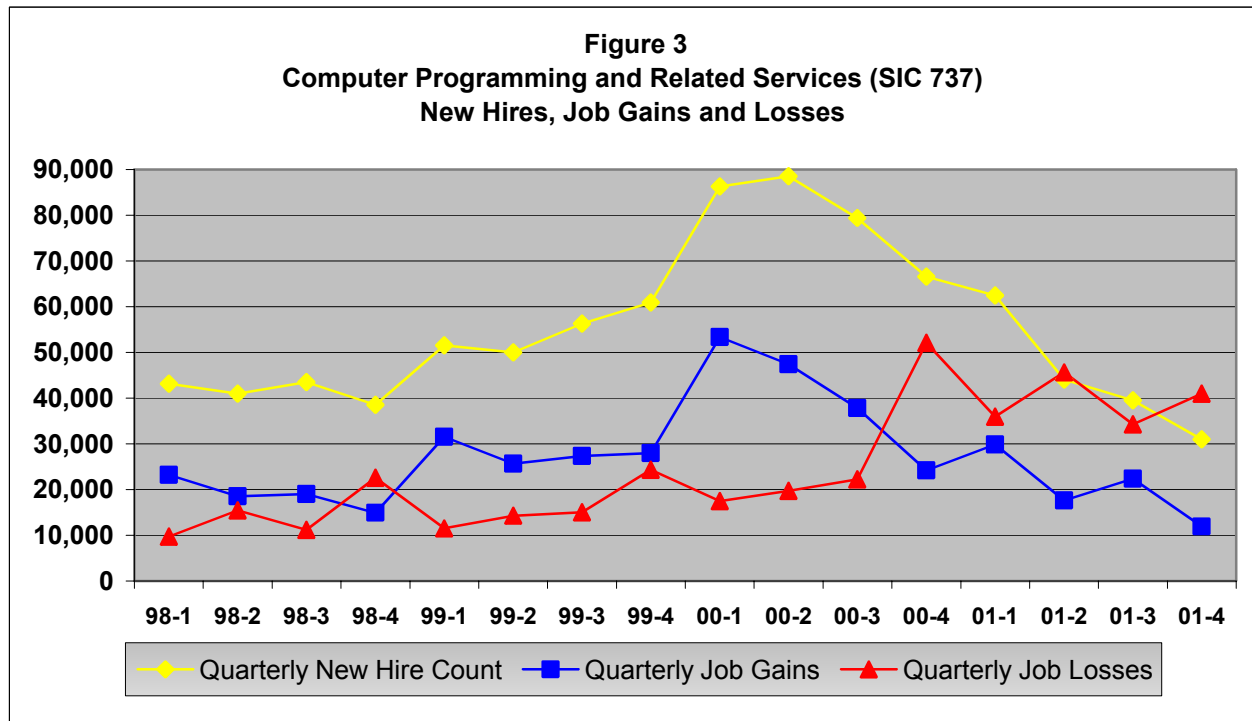
REPORTING YEAR / QUARTER	ES202 3RD MONTH EMPLOYMENT	ES202 TOTAL PAYROLL	QUARTERLY NEW HIRE COUNT	QUARTERLY JOB GAINS	QUARTERLY JOB LOSSES
2001-4	318,714	7,769,685,001	30,984	11,909	40,920
2001-3	336,619	7,585,494,408	39,487	22,382	34,279
2001-2	365,707	8,420,778,123	44,038	17,666	45,617
2001-1	387,887	9,984,614,655	62,416	29,867	35,912
ANNUAL	352,232	33,760,572,187	176,924	81,824	156,729
2000-4	400,210	10,790,320,439	66,542	24,224	52,135
2000-3	393,731	10,481,781,645	79,402	37,834	22,240
2000-2	381,336	8,906,654,053	88,535	47,432	19,745
2000-1	346,316	9,051,485,926	86,333	53,372	17,526
ANNUAL	380,398	39,230,242,063	320,812	162,861	111,646
1999-4	311,259	7,809,323,263	60,898	27,991	24,382
1999-3	291,766	6,198,026,914	56,282	27,365	15,057
1999-2	280,849	5,775,225,746	50,004	25,665	14,268
1999-1	268,635	5,397,839,042	51,525	31,551	11,506
ANNUAL	288,127	25,180,414,965	218,709	112,571	65,213
1998-4	257,520	5,339,998,156	38,515	14,961	22,578
1998-3	249,238	4,416,442,222	43,462	19,030	11,189
1998-2	242,386	4,230,633,172	40,984	18,583	15,473
1998-1	234,508	4,133,414,331	43,098	23,235	9,721
ANNUAL	245,913	18,120,487,881	166,059	75,810	58,960

quarter increases, comparing 1998 and 2000 annual payrolls shows an increase from \$18.1 billion to \$39.2 billion, or 116 percent. The increase of annual average employment from 1998 to 2000 was 54.7 percent.

The same table shows the quarterly employment and payroll data for 2001. The rise and fall of California's high-tech economy is documented by employment data. From the fourth quarter of 2000 to the fourth quarter of 2001, employment declined by 20.4 percent, or 81,500 workers. This was nearly down to the employment level in the fourth quarter of 1999.

Dynamic Employment in Computer Programming

Employment is far more complex than most annual or even monthly statistics would suggest. This is evident in looking at data about newly hired workers and counts of job gains and job losses in California's high-tech arena. Figure 3 below is based on data in Table 1. It shows how the number of new hires in the computer programming industries took off from a 1998 base of around 40,000 a quarter to nearly 90,000 in the second quarter of 2000.



A year later, the number of new hires was back down to the 1998 level. Even in the face of widely reported layoffs and the decline of high technology industries, more than 30,000 workers were hired in the last quarter of 2001 in the computer programming industry group.

The dynamics of this industry group are clear, whether average employment is going up or down. The graph shows quarterly job gains alongside job losses in 1998-2001. For example, the year 2000 started with a first quarter augmentation of more than 53,000 jobs and a loss of 17,500 jobs.

The fourth quarter saw a nearly complete reversal – 52,000 jobs lost and 24,000 jobs gained. Again, for the year 2000, while average annual employment increased by 32 percent over the previous year-- from 288,000 to 380,000-- job gains were 163,000 and job losses were 112,000. In 2001, job gains were 82,000 while job losses of 157,000 were nearly twice as high.

Self-Employment in the High-Tech Services Industries

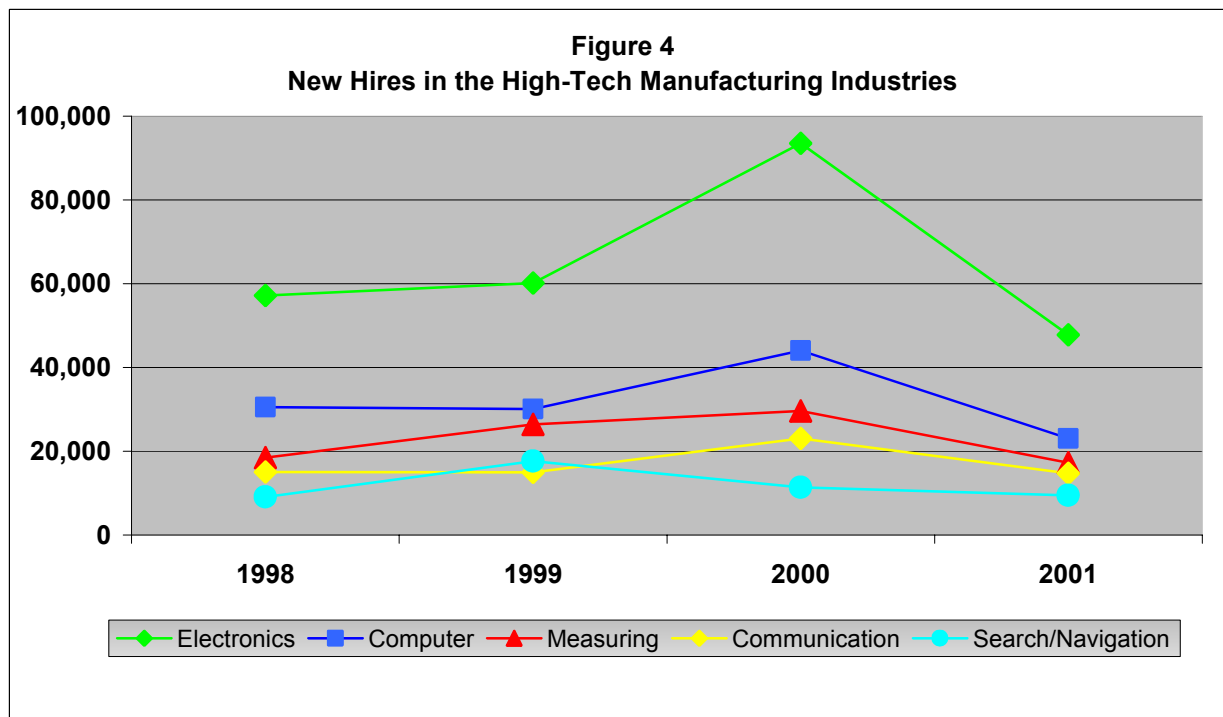
One observation made in the 2000 high-tech report pertained to the propensity for computer professionals to leave employment and start their own businesses. The context for that discussion was the shortage of IT professionals available to employers. Today the context has changed, but the opportunities for self-employment in consulting services has not necessarily diminished, particularly when highly-skilled workers are between jobs in an economic downturn.

Data from the State's unemployment insurance system indicate an increase of 2,265 employers in the computer programming industry group from the fourth quarter of 2000 to the fourth quarter of 2001. This 9.4 percent increase occurred at the same time job losses exceeded job gains by many thousands, as shown back on Table 1.

Comparable increases occurred in the communications industries as well as in both engineering services and research services. The communications industries reported an increase of 708 employers, or 14.8 percent, from the fourth quarter of 2000 to the fourth quarter of 2001. In the same period, the engineering services industry group increased by 635 employers, or 6.3 percent. Similarly, the research services industries increased by 507, or 10.8 percent of employers. These data again suggest the dynamic nature of the information technology labor market. Further, these data do not include IT professionals who started closely-held businesses on their own, without hiring staff, and thus without becoming employers.

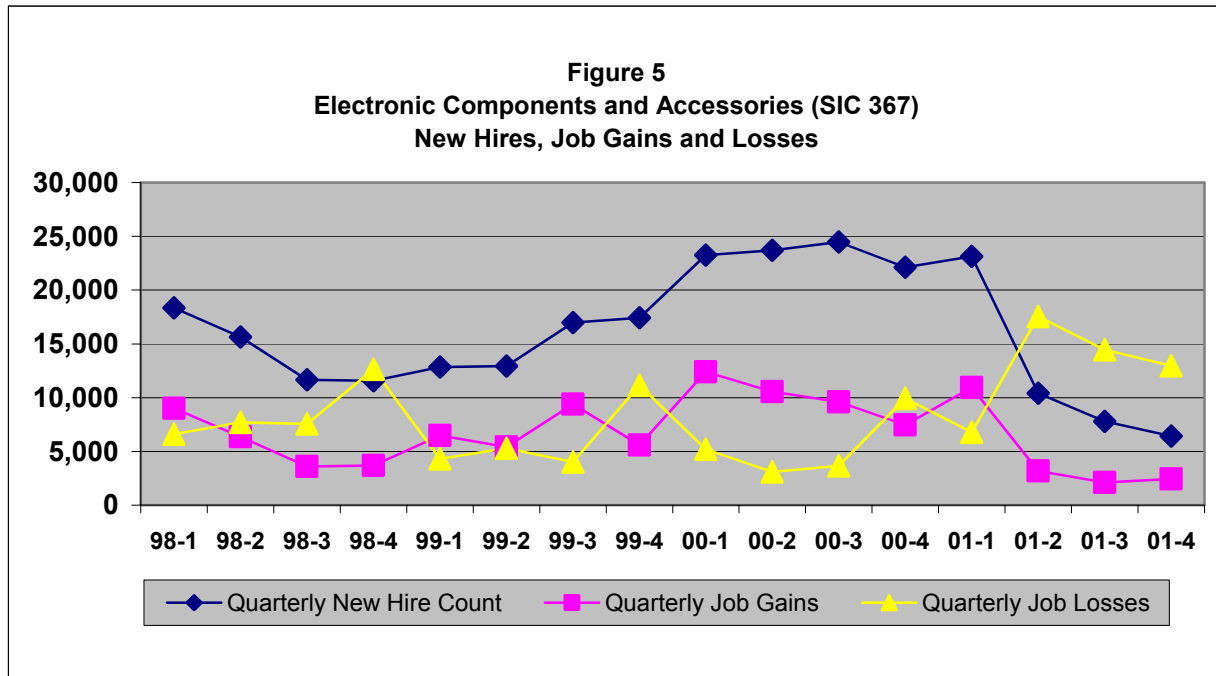
Growth and Dynamism in the Other High-Tech Industries

Employment in the other high-tech industries has not been as volatile as has been the case in computer programming. All industry groups show the familiar 1999-2001 up and down employment pattern for new hires as they do for overall employment. Figure 4 shows annual average new hires in the high-tech manufacturing industries.



There was a severe decline in new hires between the first quarter and second quarter of 2001, which is consistent with activity showing a drop in job gains and a rise in job losses. For all of 2000, there were 40,000 job gains and 22,000 job losses. The following year saw only 19,000 job gains and 52,000 job losses in this industry. Appendix Tables B-1 through B-8 show employment, new hires, job gain and job loss data for the high-tech industries (comparable to Table 1).

While annual average employment in the high-tech manufacturing industries reflect modest change in this period, the new hires data show significant activity in the electronics components manufacturing industry (SIC 367) and the computer and office equipment manufacturing industry (SIC 357). Figure 5 describes the more active electronics components industry.



Again, the dynamic job market for high-tech workers is reflected in these data, and explains why some employers in high-tech industries have continued advertising for specialized workers and even continue seeking H-1B foreign workers while laying off other workers.

We switch focus now from the high-tech industries to the IT professional occupations that make up these employment statistics.

Information Technology Occupations

Definition

We have identified 15 information technology (IT) professional occupations for this paper. They are described in the Standard Occupational Classification (SOC) system and the Occupational Information Network (O*Net). Nearly two-thirds (64 percent) of these professionals in California work in the nine high-tech industries.

Table 2
Workers in Information Technology (IT) Occupations
California 2001

SOC Code	Occupations	Workers in High-Tech Industries	Workers in All Industries	Percent of Workers in High-Tech Industries
11-3021	Computer & Information Systems Managers	16,030	31,830	50.4
15-1011	Computer & Information Scientists, Research	2,990	3,920	76.3
15-1021	Computer Programmers	35,330	61,450	57.5
15-1031	Computer Software Engineers, Applications	54,120	61,830	87.5
15-1032	Computer Software Engineers, Systems Software	39,010	43,370	89.9
15-1041	Computer Support Specialists	25,930	54,590	47.5
15-1051	Computer Systems Analysts	16,570	36,870	44.9
15-1061	Database Administrators	6,140	12,760	48.1
15-1071	Network & Computer Systems Administrators	16,570	29,670	55.8
15-1081	Network Systems & Data Communication Analysts	7,750	10,630	72.9
15-1099	Computer Specialists, All Other	5,440	15,920	34.2
17-2061	Computer Hardware Engineers	13,110	14,080	93.1
17-2072	Electronic Engineers, Except Computer	18,230	22,510	81.0
27-1014	Multi-Media Artists & Animators	2,620	5,440	48.2
27-3042	Technical Writers	4,170	6,240	66.8
	Total Employees in IT Occupations	264,010	411,110	64.2

Source: Occupational Employment Statistics (OES) Survey, 2001

Note: 1999 was the first year that the Standard Occupational Classification (SOC) system of coding was used in the OES survey. Most of these IT occupations are not reliably matched to the IT occupations in the previous OES coding system. For example, "computer engineers" and "electronic engineers" used to be the best choices for coding 15-1031, Computer Software Engineers, Applications; 15-1032, Computer Software Engineers, Systems Software; 17-2061, Computer Hardware Engineers; and 17-2072, Electronic Engineers, Except Computer.

Table 2 shows that about half the more general IT professional occupations, such as computer programmers, systems analysts, computer support specialists, and database administrators, are found throughout the California economy. Businesses in all sectors have increased their productivity by automating administrative functions, improving their primary goods-producing, distribution, sales or services activities, and modernizing communications and data storage and retrieval.

Conversely, around 90 percent of the most specialized computer professionals, such as software applications engineers, software systems engineers, and computer hardware engineers are consistently found in the high-tech industries.

Growth and Decline 1999-2001

The large increase and following decrease in employment of these IT professionals is shown on Table 3. While the nine selected high-tech industries augmented their overall employment by 15 percent from 1999 to 2000, they increased their IT professionals by 23 percent, or 87,900. This included employment growth of 39,800 software applications and software systems engineers, nearly a 50 percent increase in just a year. One of the principal sources of these professionals was through the temporary H-1B foreign labor certification program. Other IT professionals with relatively high growth were scientists, network specialists and electronic engineers, except computers.

The high-tech industry employment decline starting in 2001 also affected these IT professionals, but somewhat less than the overall high-tech industry employment decline, at least by the end of 2001. Although data are not yet available for 2002, it is widely reported that the decline of high tech employment has continued. Considering the rapid increase in IT professional workers between 1999 and 2000, it remains to be seen whether the employment numbers will drop back to the 1999 level or not.

Table 3
IT Occupational Employment Changes
California, 1999-2001

Occupations	IT Employees in all Industries 1999	IT Employees in all Industries 2000	IT Employees in all Industries 2001	Percent Change from 1999-2000	Percent Change from 2000-2001
Computer & Information Systems Managers	30,680	36,840	31,830	20.1	-13.6
Computer & Information Scientists, Research	2,080	3,380	3,920	62.5	16.0
Computer Programmers	70,660	75,250	61,450	6.5	-18.3
Computer Software Engineers, Applications	47,980	71,800	61,830	49.6	-13.9
Computer Software Engineers, Systems Software	33,530	49,550	43,370	47.8	-12.5
Computer Support Specialists	60,810	67,690	54,590	11.3	-19.4
Computer Systems Analysts	39,770	46,190	36,870	16.1	-20.2
Database Administrators	11,870	14,480	12,760	22.0	-11.9
Network & Computer Systems Administrators	24,220	30,840	29,670	27.3	-3.8
Network Systems & Data Communication Analysts	8,560	14,160	10,630	65.4	-24.9
Computer Specialists, All Other	24,170	20,940	15,920	-13.4	-24.0
Computer Hardware Engineers	10,500	10,760	14,080	2.5	30.9
Electronic Engineers, Except Computer	14,380	24,370	22,510	69.5	-7.6
Multi-Media Artists & Animators	4,340	5,000	5,440	15.2	8.8
Technical Writers	6,010	7,260	6,240	20.8	-14.0
Total Employees in IT Occupations	390,570	478,500	411,110	22.5	-12.2

Source: Occupational Employment Statistics (OES) Survey, 1999, 2000, and 2001

Note: 1999 was the first year that the Standard Occupational Classification (SOC) system of coding was used in the OES survey. Most of these IT occupations are not reliably matched to the IT occupations in the previous OES coding system. For example, "computer engineers" and "electronic engineers" used to be the best choices for coding 15-1031, 15-1032, 17-2061 and 17-2072.

Staffing Patterns - IT Professionals in High-Tech Industries

Table 4 on the next page provides a distribution of the 15 IT professional occupations within California's nine high-tech industries in 2001. Based on these staffing patterns from the Occupational Employment Statistics (OES) survey of all California industries, there were an estimated 411,000 workers in these occupations, with 264,000 of them employed in the high-tech industries. The other 147,000 IT professionals, 37 percent of the total, were not employed in the high-tech industries, but were spread throughout the rest of the industries.

Table 4
Number of Employees in Information Technology (IT) Occupations
Within High-Tech Industries
CALIFORNIA 2001

Occupations	SIC 357 Computer & Office Equipment	SIC 366 Comm. Equipment	SIC 367 Electronic Components	SIC 381 Search & Navigation Equip.	SIC 382 Measurin g & Control Devices	SIC 48 Communicatio ns	SIC 737 Computer Programming & Related Services	SIC 871 Engineering Services	SIC 873 Research Services	Total IT Employees in High- Tech Industries	Total IT Employees in All Other Industries	Total Employees in All Industries
Computer & Information Systems Managers	1,110	250	1,150	----	390	770	10,540	620	1,200	16,030	15,800	31,830
Computer & Information Scientists, Research	360	----	----	----	----	200	1,830	70	530	2,990	930	3,920
Computer Programmers	3,050	100	820	----	1,080	380	28,550	370	980	35,330	26,120	61,450
Computer Software Engineers, Applications	2,980	1,100	2,640	1,680	1,650	1,720	36,710	3,730	1,910	54,120	7,710	61,830
Computer Software Engineers, Systems Software	9,250	1,040	2,350	1,310	1,010	----	21,110	1,290	1,650	39,010	4,360	43,370
Computer Support Specialists	1,610	670	990	170	330	1,470	19,150	780	760	25,930	28,660	54,590
Computer Systems Analysts	1,340	110	790	450	390	----	12,120	500	870	16,570	20,300	36,870
Database Administrators	100	60	220	170	80	----	4,950	180	380	6,140	6,620	12,760
Network & Computer Systems Administrators	360	190	610	200	210	1,010	12,730	620	640	16,570	13,100	29,670
Network Systems & Data Communication Analysts	----	80	----	100	80	950	5,800	240	500	7,750	2,880	10,630
Computer Specialists, All Other	500	240	----	250	50	----	4,400	----	----	5,440	10,480	15,920
Computer Hardware Engineers	3,150	370	3,970	----	660	360	2,860	520	1,220	13,110	970	14,080
Electronic Engineers, Except Computer	2,110	1,280	4,140	2,980	1,210	2,640	380	2,500	990	18,230	4,280	22,510
Multi-Media Artists & Animators	20	----	20	120	40	420	1,930	40	30	2,620	2,820	5,440
Technical Writers	380	240	190	110	240	70	1,800	780	360	4,170	2,070	6,240
Total Employees in IT Occupations	26,320	5,730	17,890	7,540	7,420	9,990	164,860	12,240	12,020	264,010	147,100	411,110
Total Employees in All Occupations	89,620	38,340	138,220	48,250	65,100	191,980	319,560	127,680	122,230	1,140,980	13,234,840	14,375,820
% of IT Employees	29.4	15.0	12.9	15.6	11.4	5.2	51.6	9.6	9.8	23.1	1.2	2.9

Source: Occupational Employment Statistics (OES) Survey, 2001.

Nearly 165,000 of these workers were employed in computer programming and related services (SIC 737). This represents 62.4 percent of all the IT professionals in high-tech industries in 2001; they represent more than half the workers in this industry.

The next industries with large numbers of IT professionals are computer and office equipment manufacturing (SIC 357) with 26,300 and electronics components manufacturing (SIC 367) with 17,900. The other high-tech services industries, engineering (SIC 871) and research (SIC 873), each has about 12,000 IT professionals.

Figure 6 shows the distribution of the 264,000 IT professionals employed in the high-tech industries. Software applications and systems engineers comprise a third of these workers.

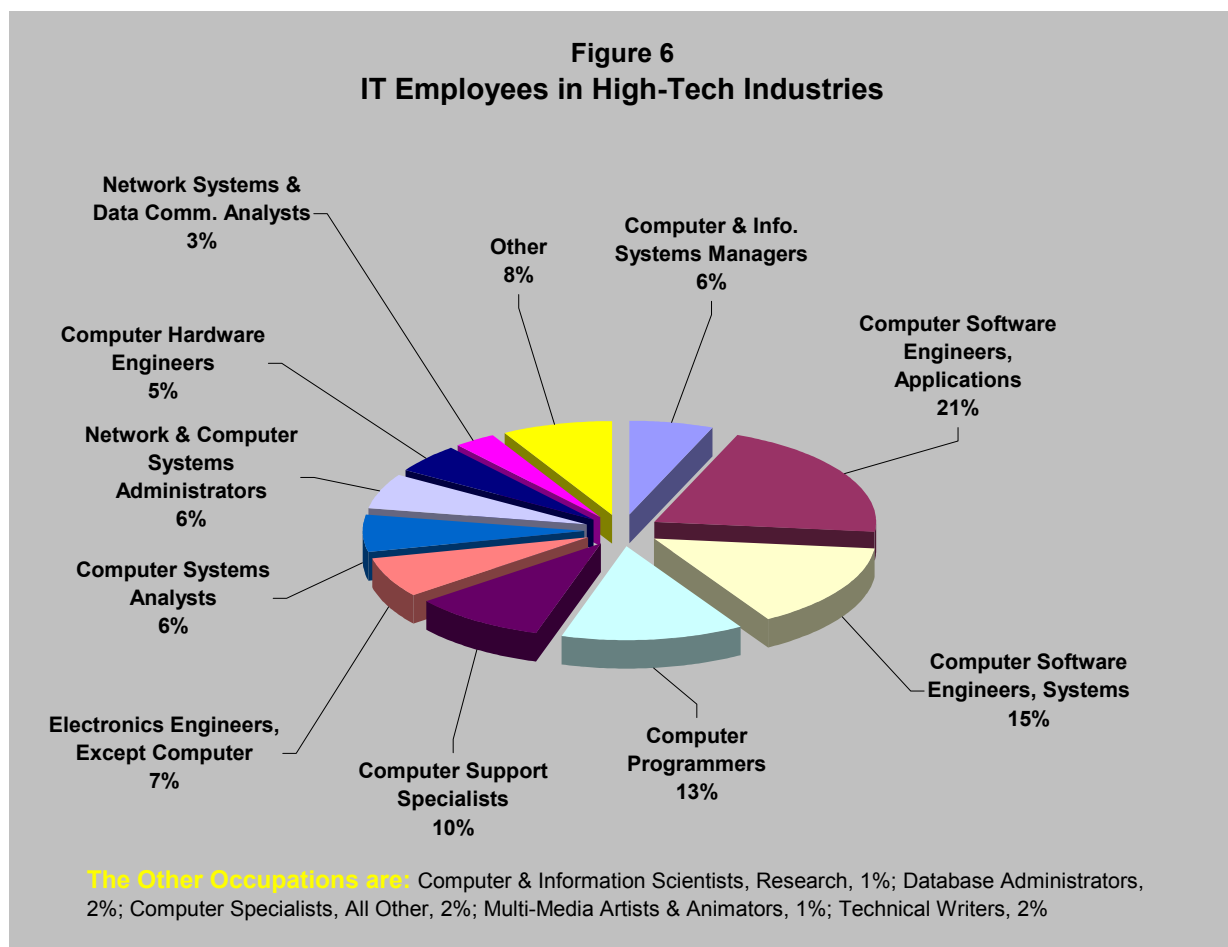
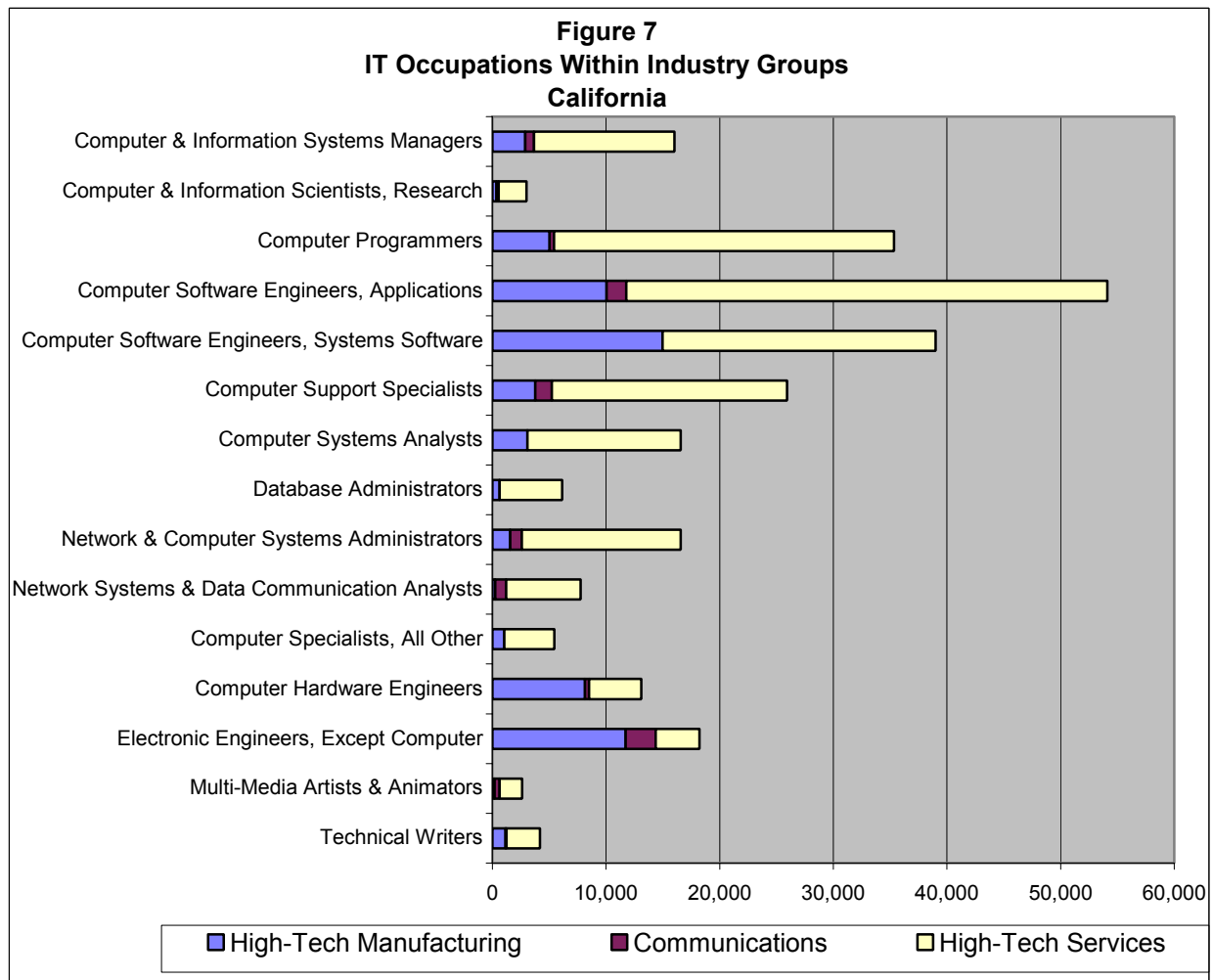
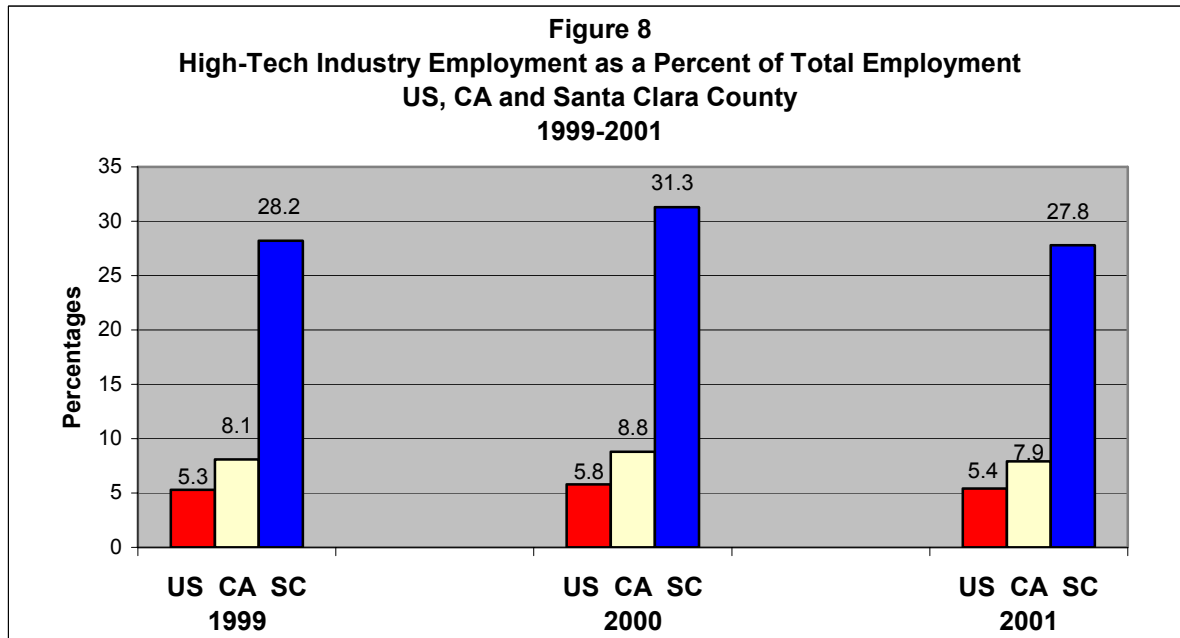


Figure 7 shows the distribution of the IT occupations within the three industry groupings of manufacturing, communications and services. By far the largest numbers are in the high-tech services industries. Only computer hardware engineers and electronic engineers are employed more often in the high-tech manufacturing industries than in high-tech services.

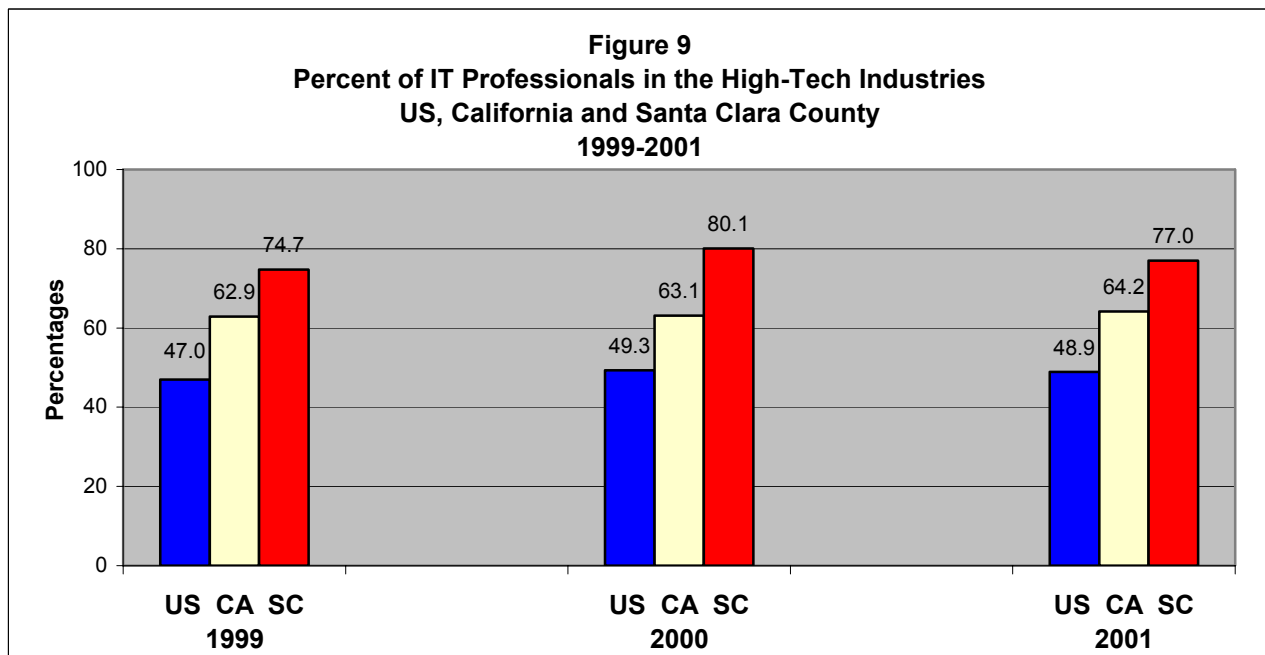


Some Comparisons - US, California and Santa Clara County

The OES survey is conducted across the entire Nation as well as in sub-state areas. Figure 8 is a comparison of the total employment in the nine selected high-tech industries in the Nation, the State, and in Santa Clara County, the heart of the Silicon Valley. The size of all high-tech employment as a proportion of all non-farm employment is an indicator of the relative importance high-tech industries are to these three geographic entities.



We also compared the staffing patterns of California's IT occupations in high-tech industries with the distribution in the Nation as a whole, and with comparable data from Santa Clara County. Figure 9 shows that IT professionals in the Nation are split about evenly between high-tech and other industries.*



* In their report called Bouncing Back: Jobs, Skills and the Continuing Demand for IT Workers, May 2002, the Information Technology Association of America (ITAA) used a very broad list of occupations to identify IT workers in a telephone survey of IT and non-IT firms. Of the 9.9 million IT workers estimated at the beginning of 2002, the report found that only 800,000 IT workers or 8.1 percent, were employed in IT companies.

Not surprisingly, Santa Clara County's IT professionals are more densely employed in high-tech industries than is the case in California as a whole, 77 percent compared to 63 percent, respectively, in 2001. In fact, these IT workers represent about one in ten of Santa Clara County's workforce, compared to about one in thirty-five in California and about one in forty in the Nation.

Appendix Tables C-1 and C-2 provide 2001 staffing pattern data for the Nation and for Santa Clara County (comparable to Table 4).

Supply and Demand for IT Professionals

In an effort to determine the extent to which employers are able to find the workers they need, a survey question about recruitment difficulty is part of the California Cooperative Occupational Information System (CCOIS). This question has been used as one analytical tool to assess the local supply of workers in an occupation and the local demand for these workers. The survey asks employers to rate the level of difficulty of finding qualified workers in specific occupations. We compiled the 1999-2002 responses of 1,965 employers who hire IT professionals. The findings can be compared to the 1995-1998 CCOIS survey responses that were described in our 2000 report called "Analysis of the Labor Supply in Information Technology Occupations." In that report the information from a variety of sources, including the CCOIS surveys, suggested in 2000 that there were not enough skilled IT workers to meet current and future demand.

In the period 1995 through 1998, 1,400 California employers with 46,500 employees reported on their experience with hiring various IT professionals. About two-thirds of these employers said it was "moderate to very difficult" to find qualified, experienced applicants.

This perspective continued for the following two years. In 1999, more than seven in ten of the 487 employers across the State, with 6,678 employees, reported "some" to "much" difficulty finding qualified applicants for their IT professional positions. In 2000, more than two-thirds of the 555 employers surveyed (16,787 employees) reported this level of difficulty.

As would be expected from the significant decline in new hires and increase of job losses described above, the supply and demand equation changed. In 2001, the CCOIS program through its local partners, asked 569 employers with 5,904 employees about their recruitment experience. While the difficulty in finding qualified workers dropped, it still averaged more than

50 percent. Even in the surveys conducted in 2002, 354 employers with 3,930 IT professionals did not find it uniformly easy to find qualified applicants. About 45 percent of them reported “some” or “much” difficulty in their recruitment efforts.

Wages paid to IT professionals

Table 5 shows the 2002 base wages of California’s IT professionals. Wages have not necessarily declined with the decline of the high-tech economy and the loss of jobs. However, the substantial reduction in total high-tech computer services industry payroll shown in Table 1 suggests that hefty end-of-year bonuses, stock options, and other widely discussed financial benefits are no longer a large part of employee compensation. But 2002 wages paid to IT professionals are well above average wages, with computer engineers commanding some of the highest salaries.

Table 5
California Wages for IT Professionals, 2002

SOC Code	Occupational Title	Entry-Level Hourly Wage (1)	Mean Hourly Wage	Mean Annual Wage
	All occupations	\$8.15	\$18.61	\$38,712
11-3021	Computer and Information Systems Managers	\$30.63	\$47.16	\$98,089
15-1011	Computer and Information Scientists, Research	\$28.55	\$43.58	\$90,646
15-1021	Computer Programmers	\$21.41	\$34.07	\$70,858
15-1031	Computer Software Engineers, Applications	\$27.00	\$39.73	\$82,643
15-1032	Computer Software Engineers, Systems Software	\$26.96	\$40.53	\$84,297
15-1041	Computer Support Specialists	\$14.53	\$22.93	\$47,692
15-1051	Computer Systems Analysts	\$22.24	\$32.86	\$68,341
15-1061	Database Administrators	\$17.90	\$31.31	\$65,117
15-1071	Network and Computer Systems Administrators	\$20.19	\$29.96	\$62,313
15-1081	Network Systems and Data Communications Analysts	\$20.87	\$33.41	\$69,485
15-1099	Computer Specialists, All Other	\$15.37	\$28.24	\$58,741
17-2061	Computer Hardware Engineers	\$27.31	\$41.16	\$85,618
17-2072	Electronics Engineers, Except Computer	\$25.75	\$36.64	\$76,210
27-1014	Multi-Media Artists and Animators	\$17.98	\$29.60	\$61,564
27-3042	Technical Writers	\$19.40	\$29.93	\$62,245

Source: Occupational Employment Statistics (OES) survey, 2001

(1) The mean of the first third of the wage distribution is provided as a proxy for entry-level wage.

Growth in High-Tech Industries and IT Occupations

Employment Projections in High-Tech Industries, 2000-2010

Projections of industry growth primarily consider the long-term trends of each specific industry group. Since the year 2000 is used as the base year, the 2010 projected employment figures are not significantly affected by the most recent decline in the high-tech economy. Equally important, though, the projections are not sent into the stratosphere by the dramatic short-term growth experienced prior to 2000. On the whole, our projections are relatively conservative and avoid reliance on data resulting from business cycle fluctuations.

Table 6
California Employment Projections by Industry
2000-2010

Industry	Annual Averages		Absolute Change	Percent Change
	2000	2010		
Computer and Office Equipment	96,300	105,100	8,800	9.1
Communications Equipment	43,500	46,300	2,800	6.4
Electronic Components and Accessories	164,500	177,500	13,000	7.9
Search and Navigation Equipment	48,600	53,900	5,300	10.9
Measuring and Controlling Devices	68,500	71,700	3,200	4.7
Total High-Tech Manufacturing	421,400	454,500	33,100	7.9
Communications	194,300	207,100	12,800	6.4
Computer and Data Processing Services	373,300	692,700	319,400	85.6
Engineering and Architectural Services	123,000	163,900	40,900	33.3
Research and Testing Services	113,400	159,300	45,900	40.5
Total High-Tech Services	609,700	1,015,900	406,200	66.6
Total High-Tech Industries	1,225,400	1,677,500	452,100	36.9
Total Nonfarm Industries	14,488,100	17,709,200	3,221,100	22.2
Percent High-Tech is of Nonfarm	8.5	9.5	14.0	

Source: Labor Market Information Division – Industry Projections, 2003

Nonfarm industry growth for California from 2000 to 2010 is projected to be 22.2 percent. Table 7 shows that high-tech manufacturing and communications industries are expected to grow at much slower rates over the ten-year period, 7.9 percent and 6.4 percent, respectively. But the high-tech services industries will grow much faster, 66.6 percent, particularly the computer programming industry group at 85.6 percent. This is an average annual rate of eight and a half percent. Employment in the engineering services (33.3 percent) and research services (40.5 percent) is also expected to grow much faster than total nonfarm industries.

Of California's projected employment growth of 3.2 million workers from 2000 to 2010, 452,100 of them (14.0 percent) will be employed in the high-tech industries. Ninety percent of them will be in high-tech services. These anticipated industry growth rates relate directly to the forecasted increase of IT professional occupations.

Employment Projections of IT Professional Occupations, 2000-2010

Occupational growth is projected by applying occupational staffing pattern data to industry growth projections. The source of staffing information is the Occupational Employment Statistics survey. Total California job growth is projected to reach 3.2 million, the same 22.2 percent growth as expected for all nonfarm industries over the ten-year period. By comparison, the projected growth of IT professionals in all nonfarm industries is 351,200, or 70.1 percent. As a percentage of the growth of all occupations from 2000 to 2010, nearly one in nine jobs resulting from industry growth in California is expected to be an IT professional occupation.

To supplement projected occupational growth data, we have added estimates of replacements (separations) in order to portray a more complete forecast of job openings. The analysis will discuss employment growth rates when comparing occupations, as shown on Table 7, but the sum of growth and replacements will be used to discuss the demand for IT workers over the decade. In this period, job openings for all occupations are projected to top seven million, or nearly half the workforce. The projected number of job openings for IT professionals is more than 400,000, or more than 80 percent of current workers in these occupations.

Among the largest and fastest growing of the IT professional occupations are software engineers, both applications software and systems software. The combined projected demand for these computer professionals is 142,500 over the ten-year period, or 14,250 per year. These IT workers are the backbone of the computer programming industry.

Table 7
California Projections of IT Professional Occupations
2000-2010

Occupational Title	Annual Averages		Employment Growth	Separations*	Total Job Openings**	Percent Job Increase
	2000	2010				
Computer & Information Systems Managers	36,200	57,700	21,500	7,900	29,400	81.2
Computer & Information Scientists, Research	5,000	7,200	2,200	500	2,700	54.0
Computer Programmers	71,500	85,900	14,400	16,500	30,900	43.2
Computer Software Engineers, Applications	73,600	151,100	77,500	7,500	85,000	115.5
Computer Software Engineers, Systems Software	55,300	107,400	52,100	5,400	57,500	104.0
Computer Support Specialists	62,200	128,600	66,400	4,000	70,400	113.2
Computer Systems Analysts	48,200	76,600	28,400	5,500	33,900	70.3
Database Administrators	15,700	26,800	11,100	900	12,000	76.4
Network & Computer Systems Administrators	34,100	68,200	34,100	2,200	36,300	106.5
Network Systems & Data Communications Analysts	17,000	31,200	14,200	1,000	15,200	89.4
Computer Specialists, All Other	23,600	38,600	15,000	2,600	17,600	74.6
Computer Hardware Engineers	16,500	20,500	4,000	2,600	6,600	40.0
Electronics Engineers, Except Computer	28,100	33,200	5,100	5,600	10,700	38.1
Multi-Media Artists & Animators	6,600	9,600	3,000	1,700	4,700	71.2
Technical Writers	7,300	9,500	2,200	2,500	4,700	64.4
Total IT Professional Occupations	500,900	852,100	351,200	66,400	417,600	83.4
Total, All Occupations	14,488,100	17,709,200	3,221,100	3,827,500	7,048,600	48.7

Source: Labor Market Information Division – Occupational Projections, 2003

*Separations from the workforce are because of retirements, leaving for other jobs, or leaving for other reasons.

**Job openings are the total of growth and separations.

High growth rates are also projected for the IT professionals employed by industries throughout the economy. Computer support specialists are often the staff expected to keep business systems functioning; and the network professionals are a growing occupation in the world of

communication systems, e-commerce, and Internet activities. The projected demand for computer support specialists is expected to reach 70,400 by 2010, or 7,040 annually. The combined demand for network administrators and analysts is 51,500, or 5,150 annually.

Overall demand in California in this decade for IT professionals is projected to be 417,600, or an annual average of 41,760 job openings. Despite fluctuations in the high-tech economy, as in the economy as a whole, there is no turning back the e-commerce, e-learning, e-government, e-business train.

Table A
Annual Employment in California High-Tech Industries
1990-2002

Industries (SIC)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002**
357 - Computer and Office Equipment	100,800	101,300	95,100	92,000	83,100	85,100	89,700	94,900	95,400	96,600	96,300	94,000	86,600
366 - Communications Equipment	30,500	29,000	30,100	30,700	30,700	34,800	38,200	38,400	39,200	40,600	43,500	44,800	41,300
367 - Electronic Components and Accessories	138,900	132,500	122,200	118,400	120,400	128,900	142,400	152,300	158,900	152,800	164,500	160,700	141,600
381 - Search and Navigation Equipment	99,300	94,100	84,000	70,700	61,400	55,400	56,300	58,500	57,200	53,400	48,600	48,200	46,700
382 - Measuring and Controlling Devices	69,500	67,500	62,900	60,700	59,500	61,200	64,200	67,300	68,500	63,100	68,500	70,400	66,400
TOTAL of High-Tech Manufacturing	439,000	424,400	394,300	372,500	355,100	365,400	390,800	411,400	419,200	406,500	421,400	418,100	382,600
48 - Communications	152,500	150,900	151,800	148,300	148,400	147,000	147,200	156,000	169,700	180,300	194,300	201,300	195,000
737 - Computer and Data Processing Services	100,700	107,500	117,700	130,500	142,300	165,300	184,700	213,000	243,000	279,700	373,300	373,500	355,200
871 - Engineering and Architectural Services	115,000	114,600	107,900	100,500	98,900	97,600	99,000	99,000	105,000	113,900	123,000	*130,800	*133,000
873 - Research and Testing Services	89,300	92,700	95,400	96,000	96,000	93,000	97,700	102,800	107,100	105,400	113,400	*121,300	*123,300
TOTAL of High-Tech Services	305,000	314,800	321,000	327,000	337,200	355,900	381,400	414,800	455,100	499,000	609,700	625,600	611,500
TOTAL of High-Tech Industries	896,500	890,100	867,100	847,800	840,700	868,300	919,400	982,200	1,044,000	1,085,800	1,225,400	1,245,000	1,189,100

* Estimates based on past years' proportion of total for SIC 87 (25.96% for SIC 871 and 24.07% for SIC 873)

** 2001 and 2002 employment estimates are the annual averages of unbenchmarked monthly data.

Source: Labor Market Information Division: Current Employment Statistics program and Covered Employment and Wages (ES202) program.

Table B-1
Computer and Office Equipment Manufacturing
(SIC 357)
California

REPORTING YEAR / QUARTER	ES202 3RD MONTH EMPLOYMENT	ES202 TOTAL PAYROLL	QUARTERLY NEW HIRE COUNT	QUARTERLY JOB GAINS	QUARTERLY JOB LOSSES
2001-4	89,648	2,247,132,952	4,095	1,338	10,863
2001-3	92,237	2,257,418,145	3,958	907	5,847
2001-2	96,925	2,578,007,628	5,970	2,746	4,303
2001-1	99,492	3,019,135,016	9,060	4,238	2,175
ANNUAL	94,576	10,101,693,741	23,083	9,229	23,188
2000-4	99,718	3,835,272,830	13,830	5,233	3,607
2000-3	97,436	4,708,474,941	10,213	3,802	4,951
2000-2	98,903	3,610,785,812	10,638	4,539	1,636
2000-1	98,511	4,740,681,840	9,332	6,233	3,946
ANNUAL	98,642	16,895,215,423	44,014	19,808	14,139
1999-4	97,194	3,429,749,318	8,797	3,483	8,036
1999-3	98,285	3,066,026,056	7,473	2,602	4,699
1999-2	98,231	2,538,362,763	7,682	14,502	2,798
1999-1	98,688	2,685,416,125	6,159	11,544	2,316
ANNUAL	98,100	11,719,554,262	30,112	32,131	17,849
1998-4	94,161	2,276,462,758	5,701	3,131	21,332
1998-3	95,471	2,065,740,291	9,881	4,752	8,202
1998-2	95,998	1,897,237,608	7,553	2,855	5,937
1998-1	97,685	2,062,795,442	7,364	3,042	4,800
ANNUAL	95,829	8,302,236,099	30,498	13,780	40,271

**Table B-2
Communications Equipment Manufacturing
(SIC 366)
California**

REPORTING YEAR / QUARTER	ES202 3RD MONTH EMPLOYMENT	ES202 TOTAL PAYROLL	QUARTERLY NEW HIRE COUNT	QUARTERLY JOB GAINS	QUARTERLY JOB LOSSES
2001-4	39,308	813,967,703	2,212	682	4,832
2001-3	40,889	788,365,018	2,929	1,292	3,606
2001-2	44,481	909,174,539	2,952	951	3,612
2001-1	46,732	984,860,180	6,667	4,086	1,780
ANNUAL	42,853	3,496,367,440	14,760	7,011	13,831
2000-4	45,568	1,086,981,739	5,713	2,253	2,239
2000-3	43,674	1,121,525,309	5,886	2,810	2,957
2000-2	42,670	863,666,773	6,081	3,224	1,379
2000-1	41,511	1,028,601,634	5,335	3,822	1,613
ANNUAL	43,356	4,100,775,455	23,016	12,109	8,187
1999-4	40,759	874,014,076	4,612	2,134	2,590
1999-3	39,868	702,041,359	3,837	1,464	2,787
1999-2	39,716	690,264,995	3,045	1,427	1,942
1999-1	40,390	691,631,076	3,435	1,425	1,608
ANNUAL	40,183	2,957,951,506	14,929	6,450	8,927
1998-4	38,155	712,802,604	4,983	2,802	2,473
1998-3	38,432	623,190,923	3,443	2,392	3,343
1998-2	36,432	572,421,836	3,328	1,532	1,125
1998-1	37,570	641,198,616	3,284	1,492	2,274
ANNUAL	37,647	2,549,613,979	15,038	8,218	9,215

Table B-3
Electronic Components and Accessories Manufacturing
(SIC 367)
California

REPORTING YEAR / QUARTER	ES202 3RD MONTH EMPLOYMENT	ES202 TOTAL PAYROLL	QUARTERLY NEW HIRE COUNT	QUARTERLY JOB GAINS	QUARTERLY JOB LOSSES
2001-4	138,375	2,850,895,637	6,425	2,430	12,955
2001-3	146,015	2,647,324,630	7,776	2,117	14,445
2001-2	159,892	3,102,525,611	10,416	3,171	17,556
2001-1	172,923	3,747,147,351	23,135	10,929	6,777
ANNUAL	154,301	12,347,893,229	47,752	18,647	51,732
2000-4	173,166	3,433,815,573	22,122	7,464	9,938
2000-3	169,129	3,858,544,285	24,461	9,608	3,657
2000-2	162,528	3,749,022,854	23,700	10,559	3,094
2000-1	157,789	4,220,949,750	23,255	12,413	5,192
ANNUAL	165,653	15,262,332,462	93,538	40,045	21,881
1999-4	151,937	3,123,491,051	17,411	5,581	11,145
1999-3	150,903	2,767,399,188	16,990	9,381	4,019
1999-2	149,230	2,548,396,069	12,940	5,413	5,287
1999-1	149,094	2,505,324,727	12,844	6,469	4,322
ANNUAL	150,291	10,944,611,035	60,186	26,844	24,772
1998-4	151,985	2,487,973,842	11,561	3,685	12,651
1998-3	155,383	2,190,696,761	11,646	3,609	7,555
1998-2	159,239	2,238,040,598	15,625	6,357	7,700
1998-1	160,073	2,329,589,126	18,334	9,014	6,590
ANNUAL	156,670	9,246,300,327	57,166	22,665	34,496

Table B-4
Search, Detection, Navigation, Instruments and Equipment Manufacturing
(SIC 381)
California

REPORTING YEAR / QUARTER	ES202 3RD MONTH EMPLOYMENT	ES202 TOTAL PAYROLL	QUARTERLY NEW HIRE COUNT	QUARTERLY JOB GAINS	QUARTERLY JOB LOSSES
2001-4	50,264	975,289,261	1,980	1,448	1,097
2001-3	47,673	943,314,968	2,928	1,944	1,168
2001-2	48,765	1,188,239,567	2,290	711	2,292
2001-1	48,313	995,997,928	2,264	569	1,077
ANNUAL	48,754	4,102,841,724	9,462	4,673	5,633
2000-4	48,290	909,261,688	2,369	810	531
2000-3	48,142	869,481,946	2,641	1,100	849
2000-2	48,291	854,039,706	2,072	609	790
2000-1	47,868	954,169,558	4,284	4,013	1,916
ANNUAL	48,148	3,586,952,898	11,365	6,531	4,086
1999-4	50,513	912,650,807	1,679	459	5,185
1999-3	51,579	922,892,312	1,689	313	2,404
1999-2	54,524	943,431,576	1,540	253	1,306
1999-1	55,625	988,880,374	12,702	8,240	1,042
ANNUAL	53,060	3,767,855,069	17,610	9,264	9,938
1998-4	56,975	976,305,879	1,660	385	4,030
1998-3	56,297	887,308,353	1,902	978	4,189
1998-2	56,794	900,344,112	2,552	971	846
1998-1	57,152	1,030,240,264	2,980	2,445	2,662
ANNUAL	56,805	3,794,198,608	9,095	4,778	11,727

Table B-5
Laboratory Apparatus and Analytical, Optical, Measuring, and Controlling Instruments
Manufacturing
(SIC 382)
California

REPORTING YEAR / QUARTER	ES202 3RD MONTH EMPLOYMENT	ES202 TOTAL PAYROLL	QUARTERLY NEW HIRE COUNT	QUARTERLY JOB GAINS	QUARTERLY JOB LOSSES
2001-4	65,172	1,254,958,296	3,590	1,463	4,071
2001-3	67,817	1,277,949,942	3,290	1,199	4,999
2001-2	71,146	1,395,323,866	4,275	1,865	2,794
2001-1	71,953	1,400,731,037	6,104	3,067	2,807
ANNUAL	69,022	5,328,963,141	17,259	7,595	14,671
2000-4	72,210	1,586,087,975	7,968	3,030	1,830
2000-3	69,615	1,893,502,836	7,478	3,114	996
2000-2	67,906	1,383,567,385	7,595	3,346	1,024
2000-1	65,940	1,515,669,353	6,598	3,118	1,759
ANNUAL	68,918	6,378,827,549	29,639	12,609	5,608
1999-4	64,262	1,410,004,870	12,870	11,314	6,951
1999-3	62,530	1,226,943,700	4,887	1,921	1,574
1999-2	62,031	1,124,620,165	4,683	1,852	3,226
1999-1	62,891	1,071,548,439	3,952	19,239	1,192
ANNUAL	62,929	4,833,117,174	26,393	34,325	12,943
1998-4	69,222	1,241,042,880	3,360	1,247	2,855
1998-3	70,851	1,106,314,571	4,263	1,361	23,381
1998-2	72,054	1,168,069,155	5,134	2,269	2,039
1998-1	70,824	1,120,353,797	5,687	3,115	1,354
ANNUAL	70,738	4,635,780,403	18,444	7,992	29,628

**Table B-6
Communications
(SIC 48)
California**

REPORTING YEAR / QUARTER	ES202 3RD MONTH EMPLOYMENT	ES202 TOTAL PAYROLL	QUARTERLY NEW HIRE COUNT	QUARTERLY JOB GAINS	QUARTERLY JOB LOSSES
2001-4	192,278	3,056,513,134	17,782	4,734	14,932
2001-3	196,536	3,100,717,623	20,003	5,034	6,757
2001-2	206,563	3,186,220,349	25,471	9,570	9,126
2001-1	208,656	3,582,480,276	38,117	26,964	8,494
ANNUAL	201,008	12,925,931,382	101,374	46,301	39,309
2000-4	197,149	3,171,045,768	23,883	5,986	26,541
2000-3	192,079	2,903,341,294	30,088	9,896	6,208
2000-2	193,995	3,478,412,326	35,197	14,107	4,689
2000-1	187,335	3,517,133,553	33,266	13,592	9,569
ANNUAL	192,640	13,069,932,941	122,434	43,582	47,006
1999-4	184,506	3,724,955,172	26,768	10,599	12,548
1999-3	180,721	3,080,679,173	27,352	11,007	6,561
1999-2	178,309	3,011,182,963	28,137	10,451	6,207
1999-1	175,612	2,883,666,725	29,705	12,730	10,816
ANNUAL	179,787	12,700,484,033	111,962	44,787	36,132
1998-4	171,175	2,328,627,768	21,704	6,822	13,854
1998-3	168,169	2,138,624,797	22,439	5,867	4,522
1998-2	165,872	2,202,716,324	21,824	5,660	4,940
1998-1	166,602	2,427,868,945	28,818	16,876	5,179
ANNUAL	167,955	9,097,837,834	94,785	35,226	28,496

Table B-7
Engineering, Architectural, and Surveying Services
(SIC 871)
California

REPORTING YEAR / QUARTER	ES202 3RD MONTH EMPLOYMENT	ES202 TOTAL PAYROLL	QUARTERLY NEW HIRE COUNT	QUARTERLY JOB GAINS	QUARTERLY JOB LOSSES
2001-4	128,719	2,430,816,871	16,293	4,544	13,266
2001-3	128,738	2,016,428,166	21,210	5,704	7,801
2001-2	131,078	2,042,613,483	21,719	6,874	7,380
2001-1	130,744	2,096,247,187	26,357	11,533	7,782
ANNUAL	129,820	8,586,105,707	85,580	28,655	36,229
2000-4	128,322	2,447,044,364	25,161	6,287	9,175
2000-3	125,851	2,381,696,499	27,791	8,313	5,519
2000-2	125,114	1,877,834,065	26,467	9,185	5,188
2000-1	119,328	1,931,805,192	24,039	8,577	5,356
ANNUAL	124,654	8,638,380,120	103,459	32,362	25,238
1999-4	118,668	2,165,257,523	21,726	6,053	8,581
1999-3	115,960	1,675,522,794	22,374	6,884	5,349
1999-2	113,823	1,656,119,411	22,790	10,034	4,837
1999-1	110,133	1,501,575,525	19,572	8,610	7,036
ANNUAL	114,646	6,998,475,253	86,463	31,581	25,802
1998-4	111,996	1,867,390,216	19,338	6,625	11,189
1998-3	109,877	1,494,972,289	20,846	6,782	4,613
1998-2	107,523	1,414,287,495	22,241	11,527	5,659
1998-1	98,714	1,308,183,216	18,236	7,770	6,531
ANNUAL	107,028	6,084,833,216	80,661	32,704	27,992

Table B-8
Research, Development and Testing Services
(SIC 873)
California

REPORTING YEAR / QUARTER	ES202 3RD MONTH EMPLOYMENT	ES202 TOTAL PAYROLL	QUARTERLY NEW HIRE COUNT	QUARTERLY JOB GAINS	QUARTERLY JOB LOSSES
2001-4	122,900	2,227,846,401	14,229	5,522	6,203
2001-3	122,560	2,113,366,270	16,287	4,522	5,742
2001-2	122,159	2,181,249,963	16,103	5,945	4,926
2001-1	121,909	2,192,463,046	17,195	7,801	5,166
ANNUAL	122,382	8,714,925,680	63,814	23,789	22,037
2000-4	118,155	2,125,865,446	17,322	5,871	6,212
2000-3	115,681	1,943,367,507	18,948	8,787	4,702
2000-2	113,853	1,851,145,218	20,810	6,223	4,570
2000-1	111,660	1,960,380,325	17,187	7,185	6,652
ANNUAL	114,837	7,880,758,496	74,267	28,066	22,135
1999-4	108,168	1,785,955,995	15,411	4,841	4,667
1999-3	106,384	1,633,215,328	17,222	5,329	3,640
1999-2	106,875	1,544,896,973	14,893	5,607	4,343
1999-1	105,972	1,504,331,254	13,124	5,950	3,160
ANNUAL	106,850	6,468,399,550	60,650	21,727	15,809
1998-4	111,309	1,814,099,885	14,245	4,628	6,286
1998-3	110,656	1,567,674,256	17,195	5,266	3,755
1998-2	110,007	1,531,202,475	15,248	5,243	4,118
1998-1	108,251	1,548,592,003	14,419	6,662	2,919
ANNUAL	110,056	6,461,568,619	61,107	21,799	17,079

Table C-1
Number of Employees in Information Technology (IT) Occupations
Within High-Tech Industries
UNITED STATES OF AMERICA 2001

SOC Code	Occupations	SIC 357 Computer & Office Equipment	SIC 366 Comm. Equipment	SIC 367 Electronic Components	SIC 381 Search & Navigation Equip.	SIC 382 Measuring & Control Devices	SIC 48 Communications	SIC 737 Computer Programming & Related Services	SIC 871 Engineering Services	SIC 873 Research Services	Total IT Employees in High-Tech Industries	Total IT Employees in All Other Industries	Total Employees in All Industries
11-3021	Computer & Information Systems Managers	3,620	1,260	3,300	1,280	1,410	9,440	60,660	4,250	5,340	90,560	176,750	267,310
15-1011	Computer & Information Scientists, Research	640	760	300	150	140	410	9,390	1,480	2,580	15,850	9,770	25,620
15-1021	Computer Programmers	10,280	1,950	2,990	660	2,240	4,720	207,680	4,560	6,590	241,670	259,880	501,550
15-1031	Computer Software Engineers, Applications	13,470	6,550	8,110	3,870	5,660	10,840	183,620	15,220	6,190	253,530	108,160	361,690
15-1032	Computer Software Engineers, Systems Software	27,950	7,220	5,810	6,310	3,750	20,250	104,130	13,260	7,500	196,180	65,340	261,520
15-1041	Computer Support Specialists	6,410	4,450	3,620	960	1,460	17,370	146,940	5,420	3,850	190,480	302,760	493,240
15-1051	Computer Systems Analysts	5,320	1,580	2,510	1,100	1,420	12,280	144,330	7,610	4,550	180,700	267,570	448,270
15-1061	Database Administrators	380	560	620	340	300	5,370	26,140	1,710	1,970	37,390	66,860	104,250
15-1071	Network & Computer Systems Administrators	1,220	1,100	1,580	530	910	15,540	58,800	4,770	3,380	87,830	140,010	227,840
15-1081	Network Systems & Data Communication Analysts	2,870	650	1,560	330	360	9,870	35,200	2,920	2,190	55,950	70,110	126,060
15-1099	Computer Specialists, All Other	----	----	----	----	----	----	----	----	----	----	----	----
17-2061	Computer Hardware Engineers	11,110	3,190	12,270	1,680	1,810	4,850	13,070	3,790	2,040	53,810	13,780	67,590
17-2072	Electronic Engineers, Except Computer	5,130	5,050	15,400	8,540	4,380	19,840	2,080	7,680	3,960	72,060	51,150	123,210
27-1014	Multi-Media Artists & Animators	40	----	70	230	90	2,990	7,030	370	320	11,140	19,390	30,530
27-3042	Technical Writers	1,180	1,050	990	610	950	710	12,400	3,180	1,650	22,720	23,180	45,900
	Total Employees in IT Occupations	89,620	35,370	59,130	26,590	24,880	134,480	1,011,470	76,220	52,110	1,509,870	1,574,710	3,084,580
	Total Employees in All Occupations	318,940	242,230	584,060	153,710	282,450	1,665,940	1,987,460	1,033,220	669,700	6,937,710	121,042,700	127,980,410
	Percent of IT Employees	28.1	14.6	10.1	17.3	8.8	8.1	50.9	7.4	7.8	21.8	1.3	2.4

Source: Occupational Employment Statistics (OES) Survey, 2001

Notes: (1) Industries with smaller numbers or percentages, such as SIC 372, Aircraft & Parts, and SIC 376, Guided Missiles, Space Vehicles & Parts, were not included.

(2) 1999 was the first year that the Standard Occupational Classification (SOC) system of coding was used in the OES survey. Most of these IT occupations are not reliably matched to the IT occupations in the previous OES coding system.

Table C-2
Number of Employees in Information Technology (IT) Occupations
Within High-Tech Industries
SANTA CLARA COUNTY 2001

SOC Code	Occupations	SIC 357 Computer & Office Equipment	SIC 366 Comm. Equipment	SIC 367 Electronic Components	SIC 381 Search & Navigation Equip.	SIC 382 Measuring & Control Devices	SIC 48 Communications	SIC 737 Computer Programming & Related Services	SIC 871 Engineering Services	SIC 873 Research Services	Total IT Employees in High-Tech Industries	Total IT Employees in All Other Industries	Total Employees in All Industries
11-3021	Computer & Information Systems Managers	630	----	430	----	230	130	3,430	110	220	5,180	1,220	6,400
15-1011	Computer & Information Scientists, Research	----	----	----	----	----	----	710	30	100	840	570	1,410
15-1021	Computer Programmers	1,980	----	290	----	----	----	6,170	----	150	8,590	3,060	11,650
15-1031	Computer Software Engineers, Applications	1,460	530	940	----	770	300	10,010	----	500	14,510	3,020	17,530
15-1032	Computer Software Engineers, Systems Software	6,040	300	1,870	----	440	40	7,250	----	420	16,360	2,950	19,310
15-1041	Computer Support Specialists	980	----	440	----	150	50	4,430	410	150	6,610	2,850	9,460
15-1051	Computer Systems Analysts	950	40	440	----	270	40	1,710	70	90	3,610	1,900	5,510
15-1061	Database Administrators	----	----	100	----	50	50	1,920	50	80	2,250	450	2,700
15-1071	Network & Computer Systems Administrators	110	50	170	----	90	50	2,630	170	130	3,400	980	4,380
15-1081	Network Systems & Data Communication Analysts	----	30	50	----	50	50	2,010	----	110	2,300	930	3,230
15-1099	Computer Specialists, All Other	----	----	----	----	----	----	900	----	----	900	1,390	2,290
17-2061	Computer Hardware Engineers	1,620	120	900	----	320	----	710	30	380	4,080	650	4,730
17-2072	Electronic Engineers, Except Computer	510	340	2,900	----	630	130	----	50	320	4,880	1,560	6,440
27-1014	Multi-Media Artists & Animators	----	----	----	----	----	----	200	----	----	200	250	450
27-3042	Technical Writers	210	90	120	----	80	----	440	30	----	970	560	1,530
	Total Employees in IT Occupations	14,490	1,500	8,650	----	3,080	840	42,520	950	2,650	74,680	22,340	97,020
	Total Employees in All Occupations	42,010	11,750	58,340	5,580	26,680	9,930	79,430	12,580	17,500	263,800	686,800	950,600
	Percent of IT Employees	34.5	12.8	14.8	----	11.5	8.5	53.5	7.6	15.1	28.3	3.3	10.2

Source: Occupational Employment Statistics (OES) Survey, 2001

Notes: (1) Industries with smaller numbers or percentages, such as SIC 372, Aircraft & Parts, and SIC 376, Guided siles, Space Vehicles & Parts, were not included.

(2) 1999 was the first year that the Standard Occupational Classification (SOC) system of coding was used in the OES survey. Most of these IT occupations are not reliably matched to the IT occupations in the previous OES coding system.